



## “FRAPPY” {Free Response AP Problem...Yay!}

The following problem is taken from an actual Advanced Placement Statistics Examination. Your task is to generate a complete, concise statistical response in 15 minutes. You will be graded based on the AP rubric and will earn a score of 0-4. After grading, keep this problem in your binder for your AP Exam preparation.

The depth from the surface of Earth to a refracting layer beneath the surface can be estimated using methods developed by seismologists. One method is based on the time required for vibrations to travel from a distant explosion to a receiving point. The depth measurement ( $M$ ) is the sum of the true depth ( $D$ ) and the random measurement error ( $E$ ). That is  $M = D + E$ . The measurement error ( $E$ ) is assumed to be normally distributed with mean 0 feet and standard deviation 1.5 feet.

### **Scoring:**

(a) If the true depth at a certain point is 2 feet, what is the probability that the depth measurement will be negative?

**E P I**

(b) Suppose three independent depth measurements are taken at the point where the true depth is 2 feet. What is the probability that at least one of these measurements will be negative?

**E P I**

(c) What is the probability that the mean of the three independent depth measurements taken at the point where the true depth is 2 feet will be negative?

**E P I**

**Total: \_\_/4**